U.S. Courthouse
J-14
D-120

original
ANDREW
GARCIA

DEVELOPMENT & BUILDING SERVICE CENTER

ONE STOP
600 SECOND ST. N.W./2ND FLOOR
ATTENTION: Tina Pohl
505-924-3900

Records Withdrawal Form

Project No. J-14-0120 Date: 01-22-98

Project Title: Proposed U.S. District Courthouse

a. File b. Mylars c. Redlines/Comments

d. Other _____

Requested By: AAR-Larkin (Alb. Blue) **Phone No.:** 275-7500
Company

Anticipated Return Date: 01-23-98

Receipt Acknowledged

I here by accept full responsibility for the security of the above noted records/plans until return receipt acknowledgement is completed. Records/plans will be returned to the Development & Building Services Center on or before the indicated anticipated return date.

Delivery Picked Up By:

Name: [illegible] Organization: _____
Print

Signed: Ray Valdez Date: 1-22-98
Phone No. 884-0882

Office Use Only

Return Acknowledged

Received by: Ray V. Date: 1-22-98
Print
Kyle Tschetter.

CITY OF
Albuquerque

April 9, 1997

Martin J. Chávez, Mayor

Mr. Sam Poole
Flatow Moore Shaffer McCabe, Inc..
809 Copper Avenue, NW
Albuquerque, New Mexico 87102

RE: NEW U.S. COURTHOUSE (4th ST. & LOMAS BLVD.) (J-14K/D-120)
ENGINEER'S STAMP DATED 4/23/96

Dear Mr. Poole:

The Drainage Report, dated April 22, 1996 and submitted to this office on 2/20/97, and the Grading and Drainage Plan, received separately on March 27, 1997, have been reviewed and are approved for Grading/Paving and Building Permit. The returns at Lomas and 3rd and at Lomas and 4th each should be able to drain north to the existing catch basins on the numbered streets. If 53.77/53.17 spot elevation is not in error (between 3rd and bus stop), this is a low point which should probably drain to the west to the new drop inlet. The 47.70 drain top elevation (southwest quadrant) should be 41.10 to match final grade. Indicate grate elevation for existing C.B. at east end of vacated Slate Avenue. In 3rd, 54.86/54.36 is low spot if it and next spot elevation to south are correct. Any changes should be reflected in the submittal for certification following construction. Should you have any questions, please call me at 768-2776.

John P. Murray, P.E.
PWD, Hydrology Division

c: Andrew Garcia
Steve Randall, Red Mountain Eng'rs.
Keith McCoy, Abide Int'l.
File

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✓File

April 22, 1996

Drainage Report for the City of Albuquerque

Proposed U.S. District Courthouse at Fourth N.W. and Lomas

Site Description

The proposed Courthouse is to be constructed on a site consisting of the present McClellan Park (2.033 acres), the adjacent Slate Street right-of-way (60' right-of-way with an average length of 301.34' equal to 0.415 acres) and the adjacent Moncor site, a gravel surfaced parking lot of 1.767 acres extent. The total area enclosed within the anticipated replat boundary is 4.235 acres.

The entire site is in FEMA (Federal Emergency Management Agency) Zone C (Reference 5) 'Areas of minimal flooding'. Flood Zone AO (DEPTH 1) is immediately adjacent to the site at the intersection of Marble and Third, indicating 'Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet'. This indicates a flood depth of one foot in the intersection for a 100-year storm, with the potentially flooded area extending away from the intersection to the north and east. A study involving the major storm drain near the site (Reference 2), a 54" line on Third, indicates insufficient capacity for a 100-year storm. Thus it appears likely that storm water will run in the streets at a significant depth in a 100- year event.

No on-site storm drains exist on the McClellan Park and Moncor plats, and these areas sheet flow without significant ponding to the surrounding streets. Slate Street between Third and Fourth Street N.W. (to be vacated and demolished) does not receive drainage from the surrounding streets. Curb inlets on the N.E., N.W. and S.W. corners of the Slate Street-Fourth Street intersection intercept flows on the west side of this section of Slate. Curb inlets at each corner of the Slate Street-Third Street intersection intercept flows on the east side of this section.

The curb inlets on the west side the Slate Street-Third Street intersection are to be removed as part of vacating the Slate Street right-of-way for the proposed Courthouse site. The removed curb inlets will be replaced by a single inlet at the new curb construction across vacated Slate Street right-of-way. This construction and associated hydrology considerations are by the City of Albuquerque, prior to development on the Courthouse site.

Pre-Development Site Runoff

AHYMO runoff from the composite site in its existing condition is estimated at 15.41 cubic feet per second (Appendix A).

Post-Development Site Runoff

The General Services Administration plans to provide underground parking at this site to help alleviate traffic congestion in downtown Albuquerque. Landscaping over the underground garage provides an opportunity for ponding, but ponding is unfeasible due to structural constraints on the underground parking structure. AHYMO runoff from the composite site after construction of the Courthouse facility is estimated at 18.8 cubic feet per second (Appendix B). The difference between post-development and pre-development runoff is 3.39 cubic feet per second.

The developed site is envisioned as having a loading dock and garage parking below street grade, with a drainage system sump and duplex pump installation to return storm water to the city stormwater sewer. The underground garage is covered and is expected to contribute a negligible volume of water to the sump. Precipitation falling on the garage access ramps is intercepted by trench drains at the bottom of the ramps.

The exposed area draining to the sump is 1.07 acres with an AHYMO peak flow of 4.80 cubic feet per second (Appendix C). The sump is to be pumped to the curb inlet at the N.W. corner of the Third Street-Lomas intersection through 44 feet of 12" ductile iron pipe. This existing curb inlet drains to the 54" line on Third Street via 45 feet of 18" pipe. The 54" line on Third intersects the Lomas Street 72" line, and continues to the Iron Street storm drain.

Drainage from 1.06 acres of roof surface, at 5.23 cubic feet per second (Appendix D), is anticipated to discharge through 70 feet of new 15" reinforced concrete pipe to a new manhole on the 54" storm drain in Third Street. This manhole should be constructed approximately 80 feet north of the most northern of two storm sewer manholes existing at the intersection of Third and Slate Streets (exact location on drawings).

The remaining peak flow discharge from the site is sheet flow at 8.79 cubic feet per second to the surrounding streets. Approximately 30% of this will flow to the Lomas Street inlet, 30% to Fourth Street inlets, 20% to Marble Street inlets, and 20% to Third Street inlets.

Curb Inlet Replacement on Lomas

A new drop-off bay along Lomas Street is envisioned for this site. This drop-off bay will will be constructed to City Standard Detail 2466 for a bus bay, with the exception of a planned 10' width, rather than 12'. Communication with Sun Tran indicates that no bus service will be provided to this drop-off bay, as its location cannot be reasonably incorporated into any routing through the downtown area.

The drop-off bay will be constructed with a valley gutter at the present curb-and-gutter flowline. The existing single Type C curb inlet will be replaced with a double Type D drop inlet at the valley gutter, with the grate elevation remaining unchanged. Grate capacity for the existing Type C curb inlet is identical to the proposed Type D drop inlet, from the Development Process Manual 22.3 D-6, and the added section of Type D inlet will accomodate the increased runoff from the site.

The existing curb inlet receives approximately 1.74 cubic feet per second peak flow from the site (Appendix E). After development, 3.04 cubic feet per second will be discharged from the site to this point (Appendix F).

Peak runoff presently flowing to this curb inlet is approximately 3.82 cubic feet per second, calculated for one half the Lomas right-of-way between the centerlines of Third and Fourth (Appendix G), and combined with the 1.74 cubic feet per second from the site. Grate capacity for a Type C inlet is 3.8 CFS (half of the graphed double Type C 7.6 CFS in 22.3 D-6, at slope = 0.002) when depth of flow reaches 0.62 feet above the grate. At the 5.12 CFS design flow the depth of flow required for a double Type C or Type D is 0.53 feet. Hence, headwater depth will be reduced and installation of a double Type D inlet will more than compensate for the increase in flow from the site, with regard to grate capacity.

The existing curb inlet pipe capacity reaches 5.12 CFS (assuming inlet control on an 18" connection between the curb inlet and the 72" Lomas storm sewer) at a headwater depth of 16" (Appendix H). Thus the headwater depth remains below the grate elevation at this inlet (existing top elevation 53.35, invert 50.90) with the proposed increase in peak flow from the developed site.

Third & Lomas NW Curb Inlet - Capacity to Accept Sump Discharge

The existing curb inlet at the northwest corner of Third and Lomas drains 6600 square feet of the west side of Third Street in addition to 15,500 square feet of the present Courthouse site. This drain presently intercepts a peak flow of 2.11 CFS (Appendix L), and discharges to the existing 54" line in Third, immediately upstream of the cross-connection with the Lomas 72" line.

After development, a diminished contributing area from the Courthouse site will reduce peak surface flow entering this curb inlet to 0.87 CFS (Appendix M). The sump draining the proposed Courthouse site will discharge a peak influx of 4.80 CFS through 44 feet of 12" ductile iron to the back of this curb inlet, creating a total peak flow of 5.67 CFS. The increase in sustained peak flow through this inlet is (5.67 CFS - 2.11 CFS) equal to 3.56 CFS.

Pumps specified by Flatow Moore Schaffer and McCabe actually operate at 7.24 CFS (Appendix O), creating an intermittant peak flow of 8.11 CFS when added to 0.87 CFS surface flow. The headwater required to move 8.11 CFS through the 18" connection from the curb inlet to the 54" storm sewer in Third Street (Appendix H - assuming inlet control) is 22". With an existing invert of 51.92, and a grate elevation of 53.91, the required 22" head is less than the 24" available. Hence, this curb inlet has sufficient existing capacity to drain the proposed peak sump pumping.

Third Street 54" Line - Capacity to Accept Sump and Roof Discharge

Roof drainage from the proposed Courthouse construction is anticipated to discharge at 5.23 CFS through 70 feet of 15" reinforced concrete pipe to a proposed manhole constructed on the 54" storm sewer in Third Street. Combined with the increase of 3.56 CFS through the curb inlet

discussed above, and accounting for the change in sheet flow from the site (-6.69 CFS), peak flow to the Third Street 54" line will be increased by 3.34 CFS.

Prior to construction of the Lomas Street 72" line, projected flow in the Third Street drain south of Lomas was 110 CFS for a 10-year storm, in a report by AAR, Inc. (Reference 2), while capacity for this section was 90 CFS. This report analyzed the need for the new 72" line in Lomas, which has now been constructed. The new 72" line is intended to distribute flows more evenly to the Barelas, Alcalde, and Broadway pumping stations, but it will have the immediate effect of intercepting flow on the 54" Third Street line. The cross-connection will distribute part of this flow to the 72" Eighth Street line, which is less heavily loaded (110 CFS projected flow with 160 CFS capacity).

The increased flow from the site, though primarily discharged to the (previously) overloaded 54" Third Street line, will be redistributed immediately at the junction with the 72" Lomas Street line. Present capacity versus flow information does not appear to be available for the Third Street 54" line at this location.

The downtown basin which encompasses the site is characterized as developed (Reference 2), and a significant increase in peak discharge is not forseen. Development of the Courthouse site contributes a relatively insignificant increase of 3.4 cubic feet per second. It is not anticipated to be a precedent justifying substantial increases from other developments in the basin.

Sump Capacity

From Flatow Moore Shaffer and McCabe, the sump will be a duplex installation with two 3250 gallon-per-minute pumps (7.24 cubic feet per second), and 30,000 gallons of storage capacity.

Capacity of On-Site Area Drains

Drains around the building perimeter move storm water out of areas that are below street level. One consideration for sizing these drains is the potential for the sides of the building to intercept a slanting rain. The 24" square grates used on the site drain 5.6 CFS at 3" ponding depth (Appendix J). Maximum runoff to the drains based on the area of the side of the building is listed below. In all cases, the side of the building (leading to the drain) is larger than the horizontal drainage area intercepted by the drain.

Grate Elevation	Runoff (100-Year)	Grate Capacity (at 3" Ponding)	Pipe Capacity-Inlet Limited (at HW/D=1 Appendix H)
53.77 (two)	0.30 CFS	5.6 CFS	1.6 CFS
52.80	0.71 CFS	5.6 CFS	2.3 CFS
51.50	0.55 CFS	5.6 CFS	2.3 CFS
50.60	0.66 CFS	5.6 CFS	2.3 CFS
49.70	0.66 CFS	5.6 CFS	2.3 CFS

The trench drain at the loading dock is 20 feet long with a minimum 1-3/4" width grate. Peak flow is expected to be 2.84 CFS. Grate capacity is 3.6 CFS without ponding (Appendix K).

The trench drains at the bottom of the garage access ramps each intercept a peak flow of 0.33 CFS, (Appendix N). These drains are part of the covered underground garage floor drainage system designed by Flatow Moore Schaffer McCabe, and they discharge to the sump. Peak runoff from the garage access ramps is included in the sump discharge calculations and overall site runoff calculations.

Drains outside the garage exits intercept a peak 0.51 CFS, and have 5.6 CFS capacity.

Maximum flow expected in the 12" reinforced concrete pipe connecting area drains is 1.01 CFS, and the capacity at the designed 1.7% slope is 6.51 CFS. Maximum flow expected in the 18" reinforced concrete pipe connecting area drains to the sump is 4.80 CFS, and capacity at the planned 1.5% slope is 11.0 CFS. The pipes and drains are somewhat oversized to accomodate potential sediment and trash accumulation.

References

(1) Topographic Survey, Red Mountain Engineers, Albuquerque, New Mexico, Job #95803, 11/27/95.

(2) Lomas Boulevard Storm Drain Design Analysis Report, Andrews, Asbury & Robert Inc., Albuquerque, New Mexico, June, 1991.

(3) Development Process Manual, Municipal Development Department, Albuquerque, New Mexico, March 1982.

(4) Standard Specifications for Public Works Construction, Public Works Department, Albuquerque, New Mexico, 1986.

(5) FIRM Flood Insurance Rate Map - City of Albuquerque, New Mexico - Panel 28 of 50 - Community Panel Number 350002 0028 C, Federal Emergency Management Agency, October 14, 1983.

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      AHYMO PROGRAM (AHYMO194) - AMAFCA Hydrologic Model - January, 1994
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   *        (GSA) OVERALL PEAK FLOW - PRE-DEVELOPMENT
   *       USING MODIFIED METHODS FOR D.P.M. CHAPTER 22
   *      AND THE INITIAL ABSTRACTION - INFILTRATION METHOD
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   START          RAINFALL BEGINS AT 0.0  HRS
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HR.
            DT =  .133333 HOURS     END TIME =   5.999986 HOURS
              .0000  .0052  .0110  .0173  .0243  .0324  .0417
              .0528  .0708  .1679  .6008 1.3315 1.5942 1.7860
             1.9372 2.0593 2.0816 2.0999 2.1157 2.1295 2.1418
             2.1531 2.1634 2.1730 2.1819 2.1902 2.1981 2.2056
             2.2127 2.2194 2.2259 2.2321 2.2380 2.2438 2.2493
             2.2546 2.2598 2.2647 2.2696 2.2743 2.2789 2.2833
             2.2876 2.2919 2.2960 2.3000

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                        PARTIAL HYDROGRAPH  101.00


       RUNOFF VOLUME=    1.09119 INCHES    =      .3829 ACRE-FEET
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     FINISH

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      INPUT FILE = gsatotal.dat

  *       (GSA) OVERALL PEAK FLOW - POST-DEVELOPMENT
  *       USING MODIFIED METHODS FOR D.P.M. CHAPTER 22
  *      AND THE INITIAL ABSTRACTION - INFILTRATION METHOD
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  RAINFALL        TYPE=1 RAIN QUARTER=0
                  ONE=2.00 SIX=2.30
                  RAIN DAY=2.70 DT=0.133333 HR

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            .0528  .0708  .1679  .6008 1.3315 1.5942 1.7860
           1.9372 2.0593 2.0816 2.0999 2.1157 2.1295 2.1418
           2.1531 2.1634 2.1730 2.1819 2.1902 2.1981 2.2056
           2.2127 2.2194 2.2259 2.2321 2.2380 2.2438 2.2493
           2.2546 2.2598 2.2647 2.2696 2.2743 2.2789 2.2833
           2.2876 2.2919 2.2960 2.3000

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    UNIT PEAK= 38.092  CFS  UNIT VOLUME= .4577    B= 526.28    P60= 2.0000
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                   PARTIAL HYDROGRAPH  101.00


    RUNOFF VOLUME=  1.72083 INCHES   =     .6039 ACRE-FEET
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      INPUT FILE = gsasump.dat

  *         U.S. DISTRICT COURT (GSA) SUMP PEAK FLOW
  *       USING MODIFIED METHODS FOR D.P.M. CHAPTER 22
  *      AND THE INITIAL ABSTRACTION - INFILTRATION METHOD
  *
  START          RAINFALL BEGINS AT 0.0  HRS
  RAINFALL        TYPE=1 RAIN QUARTER=0
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                  RAIN DAY=2.70 DT=0.133333 HR

          COMPUTED 6-HOUR RAINFALL DISTRIBUTION BASED ON NOAA ATLAS 2 - PEAK AT 1.40
HR.
          DT =  .133333 HOURS     END TIME =   5.999986 HOURS
            .0000  .0052  .0110  .0173  .0243  .0324  .0417
            .0528  .0708  .1679  .6008 1.3315 1.5942 1.7860
           1.9372 2.0593 2.0816 2.0999 2.1157 2.1295 2.1418
           2.1531 2.1634 2.1730 2.1819 2.1902 2.1981 2.2056
           2.2127 2.2194 2.2259 2.2321 2.2380 2.2438 2.2493
           2.2546 2.2598 2.2647 2.2696 2.2743 2.2789 2.2833
           2.2876 2.2919 2.2960 2.3000

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                    PARTIAL HYDROGRAPH   101.00


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   *          U.S. DISTRICT COURT (GSA) ROOF PEAK FLOW
   *        USING MODIFIED METHODS FOR D.P.M. CHAPTER 22
   *       AND THE INITIAL ABSTRACTION - INFILTRATION METHOD
   *
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                  ONE=2.00 SIX=2.30
                  RAIN DAY=2.70 DT=0.133333 HR

            COMPUTED 6-HOUR RAINFALL DISTRIBUTION BASED ON NOAA ATLAS 2 - PEAK AT 1.40
HR.
            DT =  .133333 HOURS     END TIME =    5.999986 HOURS
              .0000  .0052  .0110  .0173  .0243  .0324  .0417
              .0528  .0708  .1679  .6008 1.3315 1.5942 1.7860
             1.9372 2.0593 2.0816 2.0999 2.1157 2.1295 2.1418
             2.1531 2.1634 2.1730 2.1819 2.1902 2.1981 2.2056
             2.2127 2.2194 2.2259 2.2321 2.2380 2.2438 2.2493
             2.2546 2.2598 2.2647 2.2696 2.2743 2.2789 2.2833
             2.2876 2.2919 2.2960 2.3000

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.133333

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                       PARTIAL HYDROGRAPH  101.00


      RUNOFF VOLUME =    2.06827 INCHES    =      .1836 ACRE-FEET
      PEAK DISCHARGE RATE =      5.23 CFS  AT   1.467 HOURS   BASIN AREA =   .0017 SQ. MI.


   FINISH

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        INPUT FILE = 174.dat

   *            SAMPLE INPUT FOR AHYMO
   *       USING MODIFIED METHODS FOR D.P.M. CHAPTER 22
   *      AND THE INITIAL ABSTRACTION - INFILTRATION METHOD
   *
   START          RAINFALL BEGINS AT 0.0 HRS
   RAINFALL        TYPE=1 RAIN QUARTER=0
                ONE=2.00 SIX=2.30
                RAIN DAY=2.70 DT=0.133333 HR

            COMPUTED 6-HOUR RAINFALL DISTRIBUTION BASED ON NOAA ATLAS 2 - PEAK AT 1.40
HR.
            DT =  .133333 HOURS     END TIME =   5.999986 HOURS
              .0000  .0052  .0110  .0173  .0243  .0324  .0417
              .0528  .0708  .1679  .6008 1.3315 1.5942 1.7860
             1.9372 2.0593 2.0816 2.0999 2.1157 2.1295 2.1418
             2.1531 2.1634 2.1730 2.1819 2.1902 2.1981 2.2056
             2.2127 2.2194 2.2259 2.2321 2.2380 2.2438 2.2493
             2.2546 2.2598 2.2647 2.2696 2.2743 2.2789 2.2833
             2.2876 2.2919 2.2960 2.3000

     COMPUTE NM HYD     ID=1  HYD NO=101.0
                DA=0.000552 SQ MI
                PER A=0.0 PER B=0.0
                PER C=0.0 PER D=100.0
                TP=0.067 HR MASSRAIN=-1

       K=  .036515HR   TP=  .067000HR   K/TP RATIO=  .545000    SHAPE CONSTANT, N= 7.106420
       UNIT PEAK= 4.3359   CFS  UNIT VOLUME=  .4571     B=  526.28    P60= 2.0000
       AREA=    .000552 SQ MI   IA=  .10000 INCHES   INF=  .04000 INCHES PER HOUR
       RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD - DT =
.133333

     PRINT HYD        ID=1  CODE=1

                       PARTIAL HYDROGRAPH  101.00


       RUNOFF VOLUME=   2.06827 INCHES   =      .0609 ACRE-FEET
       PEAK DISCHARGE RATE=     1.74 CFS  AT   1.467 HOURS  BASIN AREA=   .0006 SQ. MI.

     FINISH

       NORMAL PROGRAM FINISH       END TIME (HR:MIN:SEC) = 15:59:14
```

```
      AHYMO PROGRAM (AHYMO194) - AMAFCA Hydrologic Model - January, 1994
         RUN DATE (MON/DAY/YR) = 03/08/1996
         START TIME (HR:MIN:SEC) = 16:06:14    USER NO.= RED_MTNM.194
         INPUT FILE = sample.dat

   *              SAMPLE INPUT FOR AHYMO
   *        USING MODIFIED METHODS FOR D.P.M. CHAPTER 22
   *       AND THE INITIAL ABSTRACTION - INFILTRATION METHOD
   *
   START           RAINFALL BEGINS AT 0.0  HRS
   RAINFALL          TYPE=1 RAIN QUARTER=0
                  ONE=2.00 SIX=2.30
                  RAIN DAY=2.70 DT=0.133333 HR

            COMPUTED 6-HOUR RAINFALL DISTRIBUTION BASED ON NOAA ATLAS 2 - PEAK AT 1.40
HR.
            DT =   .133333 HOURS      END TIME =    5.999986 HOURS
              .0000  .0052  .0110  .0173  .0243  .0324  .0417
              .0528  .0708  .1679  .6008 1.3315 1.5942 1.7860
             1.9372 2.0593 2.0816 2.0999 2.1157 2.1295 2.1418
             2.1531 2.1634 2.1730 2.1819 2.1902 2.1981 2.2056
             2.2127 2.2194 2.2259 2.2321 2.2380 2.2438 2.2493
             2.2546 2.2598 2.2647 2.2696 2.2743 2.2789 2.2833
             2.2876 2.2919 2.2960 2.3000

      COMPUTE NM HYD      ID=1   HYD NO=101.0
                  DA=0.000965 SQ MI
                  PER A=0.0 PER B=0.0
                  PER C=0.0 PER D=100.0
                  TP=0.067 HR MASSRAIN=-1

        K =  .036515HR   TP =  .067000HR   K/TP RATIO =  .545000    SHAPE CONSTANT, N =  7.106420
        UNIT PEAK =  7.5799   CFS  UNIT VOLUME =  .4571     B =  526.28     P60 = 2.0000
        AREA =     .000965 SQ MI   IA =   .10000 INCHES   INF =   .04000 INCHES PER HOUR
        RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD - DT =
.133333

      PRINT HYD         ID=1  CODE=1

                          PARTIAL HYDROGRAPH  101.00


        RUNOFF VOLUME =    2.06827 INCHES    =      .1064 ACRE-FEET
        PEAK DISCHARGE RATE =      3.04 CFS  AT   1.467 HOURS   BASIN AREA =   .0010 SQ. MI.

      FINISH

        NORMAL PROGRAM FINISH        END TIME (HR:MIN:SEC) = 16:06:21
```

APPENDIX 'G'

```
     AHYMO PROGRAM (AHYMO194) - AMAFCA Hydrologic Model - January, 1994
       RUN DATE (MON/DAY/YR) = 02/07/1996
       START TIME (HR:MIN:SEC) = 15:14:51    USER NO.= RED_MTNM.194
       INPUT FILE = gsalomas.dat

  *            GSA LOMAS STREET CURB INLET
  *       USING MODIFIED METHODS FOR D.P.M. CHAPTER 22
  *      AND THE INITIAL ABSTRACTION - INFILTRATION METHOD
  *
  START          RAINFALL BEGINS AT 0.0  HRS
  RAINFALL        TYPE=1 RAIN QUARTER=0
                  ONE=2.00 SIX=2.30
                  RAIN DAY=2.70 DT=0.133333 HR

          COMPUTED 6-HOUR RAINFALL DISTRIBUTION BASED ON NOAA ATLAS 2 - PEAK AT 1.40
HR.
          DT =  .133333 HOURS     END TIME =   5.999986 HOURS
            .0000  .0052  .0110  .0173  .0243  .0324  .0417
            .0528  .0708  .1679  .6008 1.3315 1.5942 1.7860
           1.9372 2.0593 2.0816 2.0999 2.1157 2.1295 2.1418
           2.1531 2.1634 2.1730 2.1819 2.1902 2.1981 2.2056
           2.2127 2.2194 2.2259 2.2321 2.2380 2.2438 2.2493
           2.2546 2.2598 2.2647 2.2696 2.2743 2.2789 2.2833
           2.2876 2.2919 2.2960 2.3000

  COMPUTE NM HYD     ID=1  HYD NO=101.0
                  DA=0.0006617 SQ MI
                  PER A=0.0 PER B=0.0
                  PER C=0.0 PER D=100.0
                  TP=0.067 HR MASSRAIN=-1

    K=  .036515HR   TP=  .067000HR   K/TP RATIO=  .545000    SHAPE CONSTANT, N= 7.106420
    UNIT PEAK=  5.1976   CFS  UNIT VOLUME=  .4571     B=  526.28    P60= 2.0000
    AREA=    .000662 SQ MI   IA=  .10000 INCHES   INF=  .04000 INCHES PER HOUR
    RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD - DT =
.133333

  PRINT HYD        ID=1  CODE=1

                    PARTIAL HYDROGRAPH  101.00


    RUNOFF VOLUME=   2.06827 INCHES   =     .0730 ACRE-FEET
    PEAK DISCHARGE RATE=     2.08 CFS  AT  1.467 HOURS  BASIN AREA=  .0007 SQ. MI.

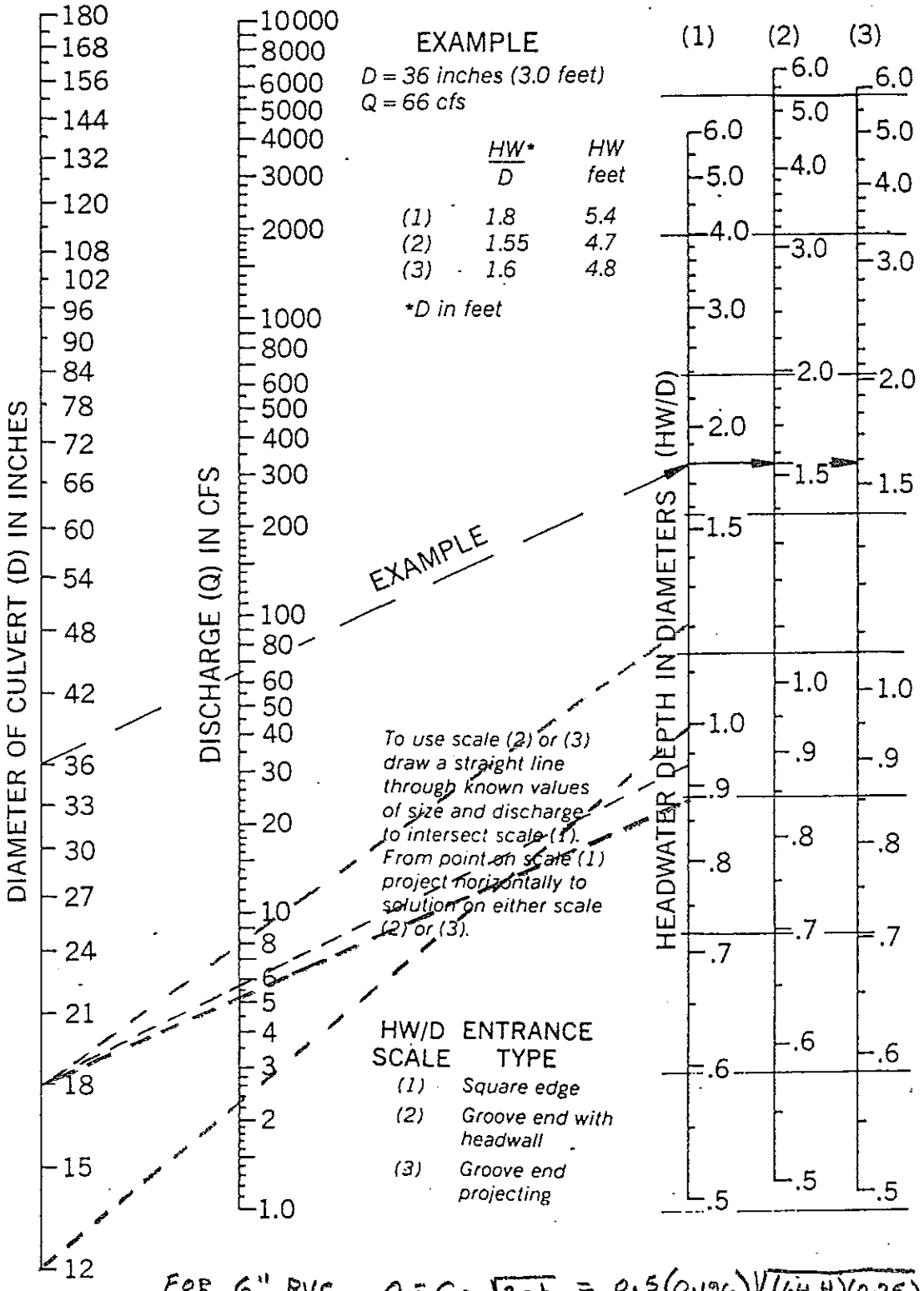


  FINISH

    NORMAL PROGRAM FINISH       END TIME (HR:MIN:SEC) = 15:14:58
```

FIGURE 33

HEADWATER DEPTH FOR CIRCULAR CONCRETE PIPE CULVERTS WITH INLET CONTROL



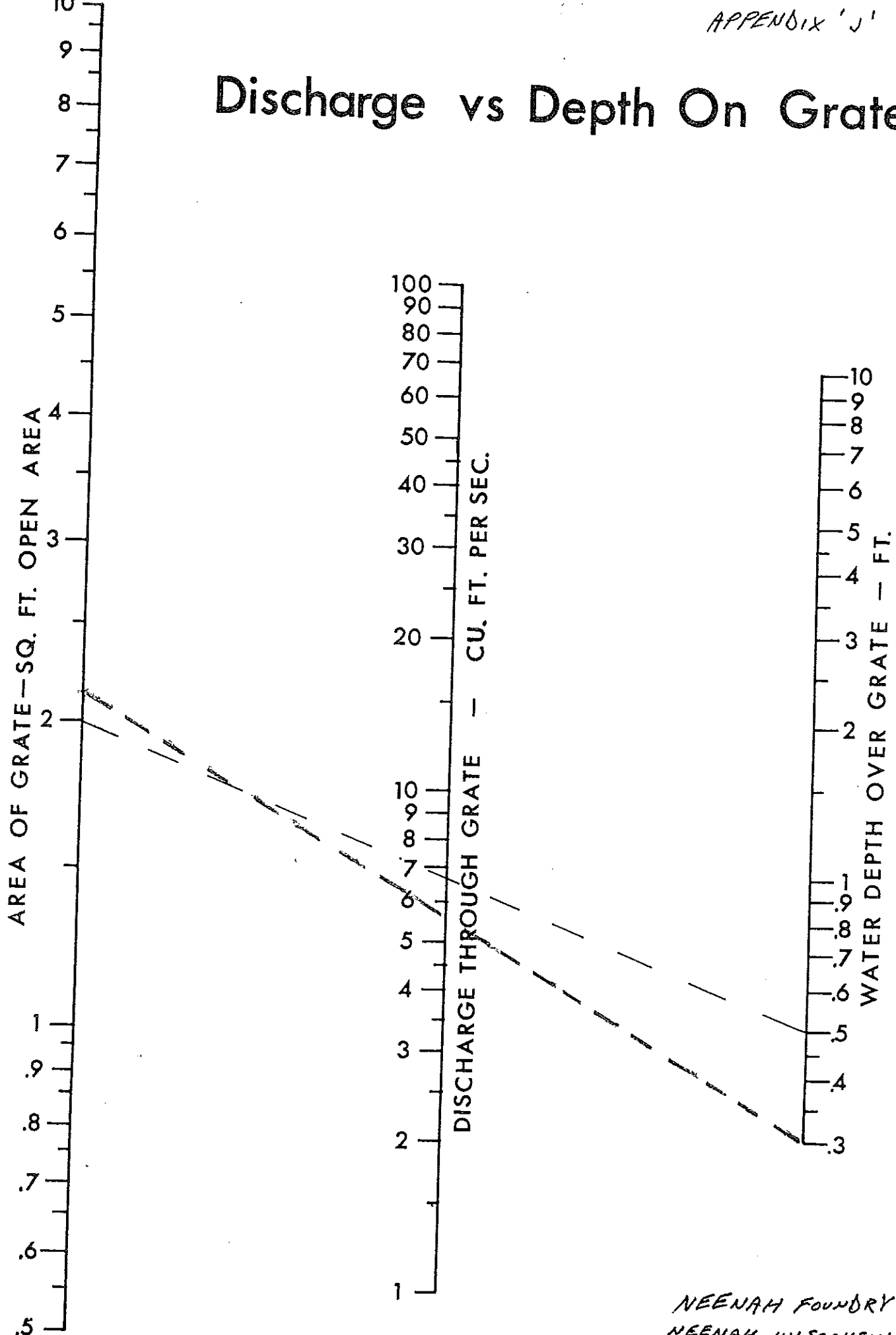
FOR 6" PVC, $Q = C_a\sqrt{2gh} = 0.5(0.196)\sqrt{(64.4)(0.25)} = 1.58$ CFS

BUREAU OF PUBLIC ROADS JAN. 1963

HEADWATER SCALES 2&3
REVISED MAY 1964

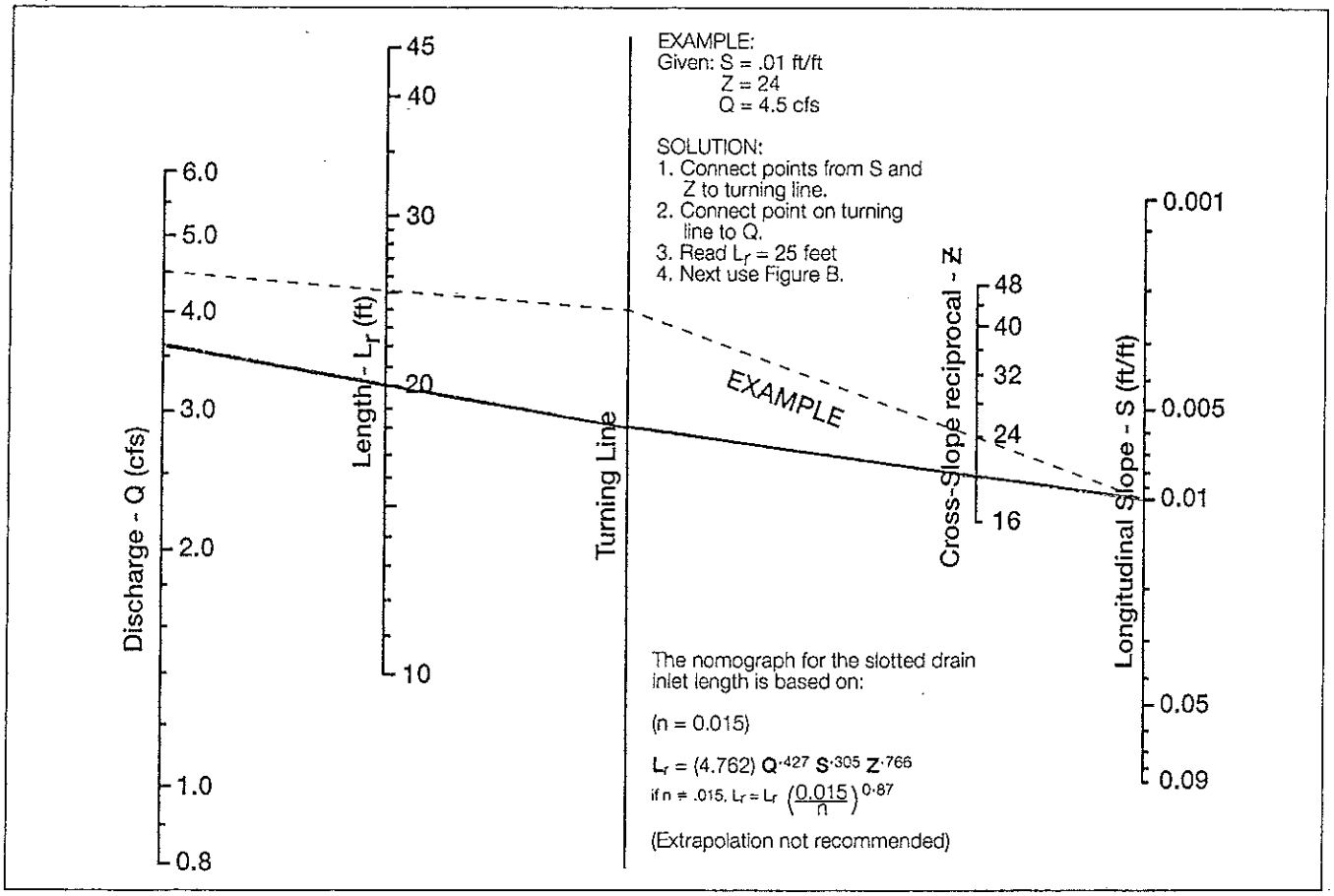
APPENDIX 'J'

Discharge vs Depth On Grate



NEENAH FOUNDRY CO
NEENAH, WISCONSIN 1981

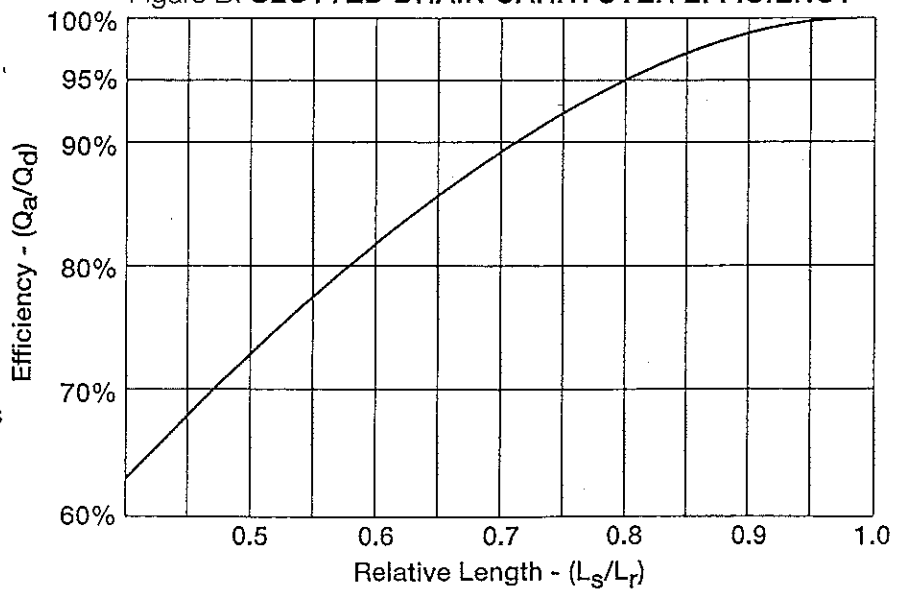
Figure A: **NOMOGRAPH—SLOTTED DRAIN ON GRADE IN CURB AND GUTTER**



Definitions

- S — Longitudinal gutter or channel slope, ft/ft
- S_x — Transverse slope, ft/ft
- Z — Transverse slope reciprocal $\left(\frac{1}{S_x}\right)$, ft/ft
- d — Depth of flow over the slot, ft
- L — Length of slot, ft
- L_r — Length of slot required for total interception, ft
- L_s — A selected length of slot, ft
- Q — Discharge into inlet, cfs
- Q_d — Total discharge at an inlet, cfs
- Q_a — An allowed discharge, cfs
- C — Runoff coefficient
- I — Rainfall intensity, ft/sec
- A — Area drained

Figure B: **SLOTTED DRAIN CARRYOVER EFFICIENCY**



Example: Solution from Figure A is L_r = 25 feet. If a standard 20-foot length is used, relative length ratio L_s/L_r = 20 ft/25 ft = 0.8. From Figure B with a relative length ratio of 0.8, the efficiency is 95%. Ninety-five percent of the flow is intercepted by the 20-foot length, and 5% runs down the gutter to be intercepted by the next slot.

SOURCE: CONTECH

```
      AHYMO PROGRAM (AHYMO194) - AMAFCA Hydrologic Model - January, 1994
        RUN DATE (MON/DAY/YR) = 02/09/1996
        START TIME (HR:MIN:SEC) = 14:24:45    USER NO.= RED_MTNM.194
        INPUT FILE = 3RD&LOM.PRE

   *      GSA THIRD & LOMAS CURB DRAIN - PRE-DEVELOPMENT
   *      USING MODIFIED METHODS FOR D.P.M. CHAPTER 22
   *     AND THE INITIAL ABSTRACTION - INFILTRATION METHOD
   *
   START          RAINFALL BEGINS AT 0.0 HRS
   RAINFALL        TYPE=1 RAIN QUARTER=0
                ONE=2.00 SIX=2.30
                RAIN DAY=2.70 DT=0.133333 HR

          COMPUTED 6-HOUR RAINFALL DISTRIBUTION BASED ON NOAA ATLAS 2 - PEAK AT 1.40
HR.
          DT =  .133333 HOURS    END TIME =   5.999986 HOURS
            .0000  .0052  .0110  .0173  .0243  .0324  .0417
            .0528  .0708  .1679  .6008 1.3315 1.5942 1.7860
           1.9372 2.0593 2.0816 2.0999 2.1157 2.1295 2.1418
           2.1531 2.1634 2.1730 2.1819 2.1902 2.1981 2.2056
           2.2127 2.2194 2.2259 2.2321 2.2380 2.2438 2.2493
           2.2546 2.2598 2.2647 2.2696 2.2743 2.2789 2.2833
           2.2876 2.2919 2.2960 2.3000

   COMPUTE NM HYD     ID=1  HYD NO=101.0
                DA=0.000797 SQ MI
                PER A=0.0 PER B=0.0
                PER C=70.2 PER D=29.8
                TP=0.067 HR MASSRAIN=-1

     K= .036515HR  TP= .067000HR  K/TP RATIO= .545000   SHAPE CONSTANT, N= 7.106420
     UNIT PEAK= 1.8656  CFS  UNIT VOLUME= .4555    B= 526.28    P60= 2.0000
     AREA=    .000238 SQ MI  IA=  .10000 INCHES  INF=  .04000 INCHES PER HOUR
     RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD - DT =
.133333


     K= .053948HR  TP= .067000HR  K/TP RATIO= .805200   SHAPE CONSTANT, N= 4.445615
     UNIT PEAK= 3.2055  CFS  UNIT VOLUME= .6035    B= 383.86    P60= 2.0000
     AREA=    .000559 SQ MI  IA=  .35000 INCHES  INF=  .83000 INCHES PER HOUR
     RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD - DT =
.133333

   PRINT HYD       ID=1  CODE=1

                    PARTIAL HYDROGRAPH  101.00


     RUNOFF VOLUME=  1.38283 INCHES   =     .0588 ACRE-FEET
     PEAK DISCHARGE RATE=    2.11 CFS  AT  1.467 HOURS  BASIN AREA=  .0008 SQ. MI.

   FINISH

     NORMAL PROGRAM FINISH      END TIME (HR:MIN:SEC) = 14:24:52
```

```
      AHYMO PROGRAM (AHYMO194) - AMAFCA Hydrologic Model - January, 1994
        RUN DATE (MON/DAY/YR) = 02/09/1996
        START TIME (HR:MIN:SEC) = 14:31:51    USER NO.= RED_MTNM.194
        INPUT FILE = 3RD&LOM.PST

   *     GSA THIRD & LOMAS CURB INLET - POST DEVELOPMENT
   *      USING MODIFIED METHODS FOR D.P.M. CHAPTER 22
   *     AND THE INITIAL ABSTRACTION - INFILTRATION METHOD
   *
   START          RAINFALL BEGINS AT 0.0 HRS
   RAINFALL        TYPE=1 RAIN QUARTER=0
                  ONE=2.00 SIX=2.30
                  RAIN DAY=2.70 DT=0.133333 HR

            COMPUTED 6-HOUR RAINFALL DISTRIBUTION BASED ON NOAA ATLAS 2 - PEAK AT 1.40
HR.
            DT =  .133333 HOURS     END TIME =   5.999986 HOURS
              .0000  .0052  .0110  .0173  .0243  .0324  .0417
              .0528  .0708  .1679  .6008 1.3315 1.5942 1.7860
             1.9372 2.0593 2.0816 2.0999 2.1157 2.1295 2.1418
             2.1531 2.1634 2.1730 2.1819 2.1902 2.1981 2.2056
             2.2127 2.2194 2.2259 2.2321 2.2380 2.2438 2.2493
             2.2546 2.2598 2.2647 2.2696 2.2743 2.2789 2.2833
             2.2876 2.2919 2.2960 2.3000

     COMPUTE NM HYD     ID=1  HYD NO=101.0
                  DA=0.000276 SQ MI
                  PER A=0.0 PER B=0.0
                  PER C=0.0 PER D=100.0
                  TP=0.067 HR MASSRAIN=-1

       K =  .036515HR   TP =  .067000HR   K/TP RATIO =  .545000    SHAPE CONSTANT, N =  7.106420
       UNIT PEAK =  2.1679   CFS  UNIT VOLUME =  .4555     B =  526.28     P60 = 2.0000
       AREA =     .000276 SQ MI   IA =   .10000 INCHES   INF =  .04000 INCHES PER HOUR
       RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD - DT =
.133333

     PRINT HYD        ID=1  CODE=1

                        PARTIAL HYDROGRAPH  101.00


       RUNOFF VOLUME =    2.06827 INCHES    =      .0304 ACRE-FEET
       PEAK DISCHARGE RATE =      .87 CFS  AT   1.467 HOURS   BASIN AREA =   .0003 SQ. MI.


     FINISH

       NORMAL PROGRAM FINISH       END TIME (HR:MIN:SEC) = 14:31:58
```

APPENDIX 'N'

```
 AHYMO PROGRAM (AHYMO194) - AMAFCA Hydrologic Model - January, 1994
   RUN DATE (MON/DAY/YR) = 02/19/1996
   START TIME (HR:MIN:SEC) = 11:19:46    USER NO.= RED_MTNM.194
   INPUT FILE = GSARAMP.DAT

*          GARAGE ACCESS RAMP PEAK RUNOFF
*       USING MODIFIED METHODS FOR D.P.M. CHAPTER 22
*      AND THE INITIAL ABSTRACTION - INFILTRATION METHOD
*
START          RAINFALL BEGINS AT 0.0  HRS
RAINFALL        TYPE=1 RAIN QUARTER=0
            ONE=2.00 SIX=2.30
            RAIN DAY=2.70 DT=0.133333 HR

         COMPUTED 6-HOUR RAINFALL DISTRIBUTION BASED ON NOAA ATLAS 2 - PEAK AT 1.40
HR.
         DT =  .133333 HOURS     END TIME =   5.999986 HOURS
           .0000  .0052  .0110  .0173  .0243  .0324  .0417
           .0528  .0708  .1679  .6008 1.3315 1.5942 1.7860
          1.9372 2.0593 2.0816 2.0999 2.1157 2.1295 2.1418
          2.1531 2.1634 2.1730 2.1819 2.1902 2.1981 2.2056
          2.2127 2.2194 2.2259 2.2321 2.2380 2.2438 2.2493
          2.2546 2.2598 2.2647 2.2696 2.2743 2.2789 2.2833
          2.2876 2.2919 2.2960 2.3000

  COMPUTE NM HYD    ID=1  HYD NO=101.0
            DA=0.000102 SQ MI
            PER A=0.0 PER B=0.0
            PER C=0.0 PER D=100.0
            TP=0.067 HR MASSRAIN=-1

    K=  .036515HR   TP=  .067000HR   K/TP RATIO=  .545000    SHAPE CONSTANT, N=  7.106420
    UNIT PEAK=  .80120   CFS  UNIT VOLUME=  .4503     B=  526.28     P60=2.0000
    AREA=     .000102 SQ MI   IA=  .10000 INCHES   INF=  .04000 INCHES PER HOUR
    RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD - DT =
.133333

  PRINT HYD        ID=1  CODE=1

                    PARTIAL HYDROGRAPH  101.00


    RUNOFF VOLUME=   2.06827 INCHES   =      .0113 ACRE-FEET
    PEAK DISCHARGE RATE=      .33 CFS  AT   1.467 HOURS  BASIN AREA=  .0001 SQ. MI.

  FINISH

    NORMAL PROGRAM FINISH       END TIME (HR:MIN:SEC) = 11:19:53
```

AFTER DATA FROM:
F.E.MYERS, A PENTAIR COMPANY
1101 MYERS PARKWAY
ASHLAND, OHIO 44805-1969 419/269-1144